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(54) **GLUCOSE TEST DEVICE**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,892,183 B2 *	2/2011	Boecker	A61B 5/1411
				600/573
2004/0098009 A1 *	5/2004	Boecker	A61B 5/1411
				606/181
2006/0052723 A1	3/2006	Roe		
2008/0109024 A1	5/2008	Berkovitch et al.		

(Continued)

FOREIGN PATENT DOCUMENTS

EP	2030567	3/2009
EP	2130493	12/2009
WO	2014029583	2/2014

OTHER PUBLICATIONS

“Office Action of Europe Counterpart Application”, issued on Jul. 1, 2015, p. 1-p. 4, in which the listed references were cited.

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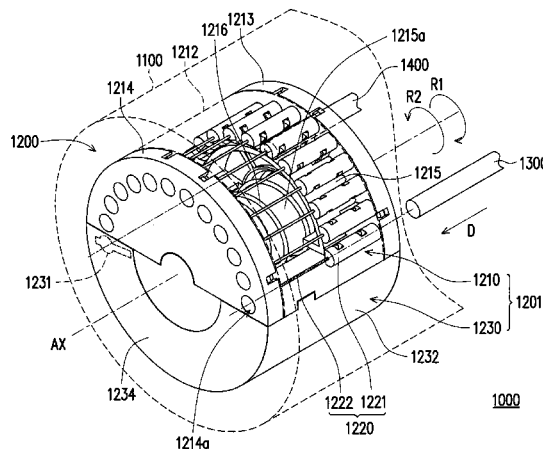
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ABSTRACT

A glucose test device and its carrying unit are provided. The glucose test device includes a housing, the carrying unit, a first push rod, and a second push rod. The carrying unit is detachably assembled in the housing. The carrying unit includes a first cartridge, lancets, a second cartridge, and strips. The first cartridge has first perforated grooves, and the lancets are slidably disposed in the first perforated grooves respectively. The second cartridge is adjacent to the first cartridge, and the second cartridge has second perforated grooves. The strips are slidably disposed in the second perforated grooves respectively. The first push rod as corresponding to the first cartridge is movably disposed in the housing. The second push rod as corresponding to the second cartridge is movably disposed in the housing, wherein the first push rod is parallel to the second push rod.

14 Claims, 6 Drawing Sheets



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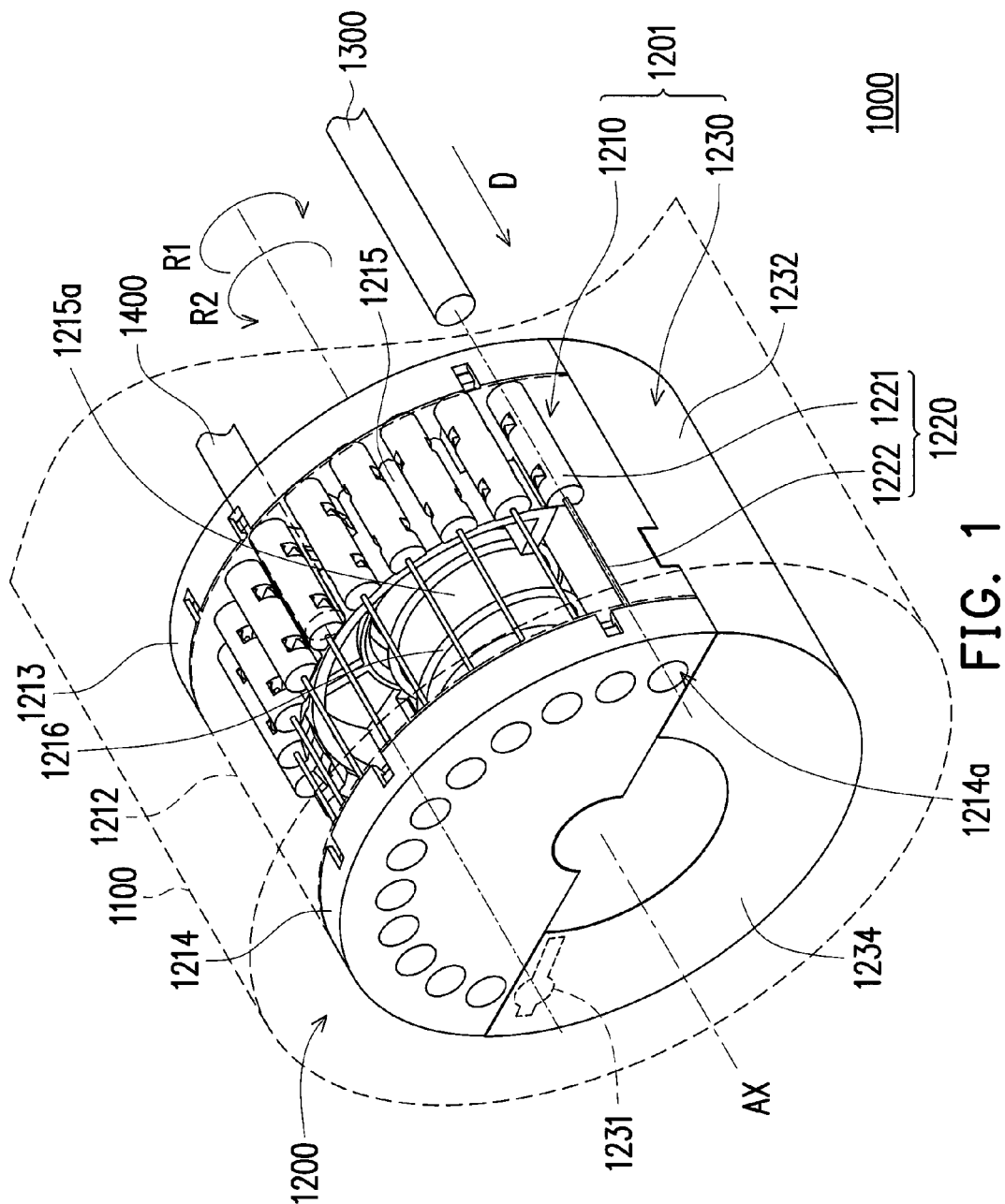
(56)

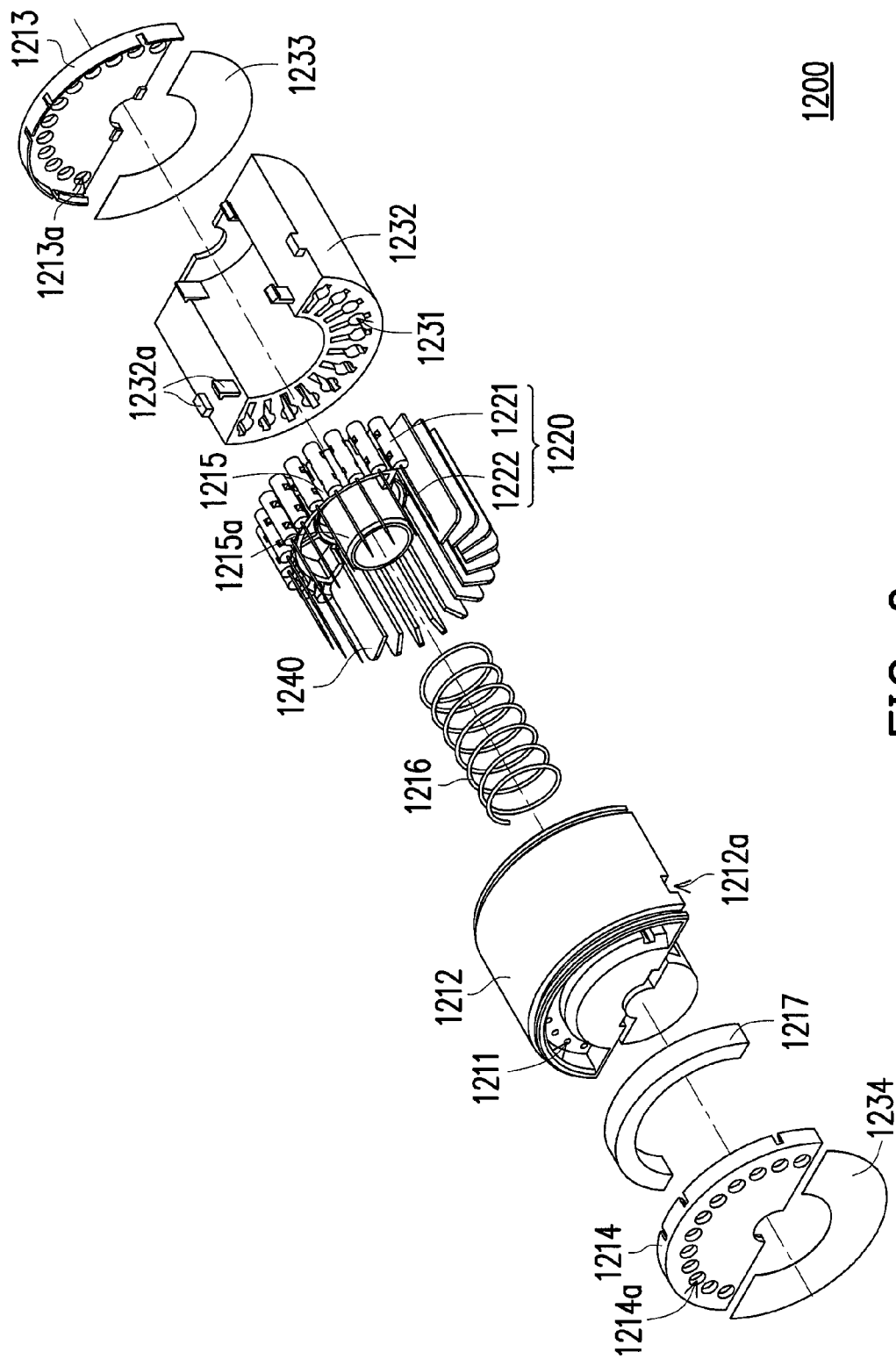
References Cited

U.S. PATENT DOCUMENTS

2011/0282173	A1 *	11/2011	Fonduca	A61B 5/1411
				600/365
2012/0330119	A1 *	12/2012	Shaanan	A61B 5/14532
				600/347

* cited by examiner





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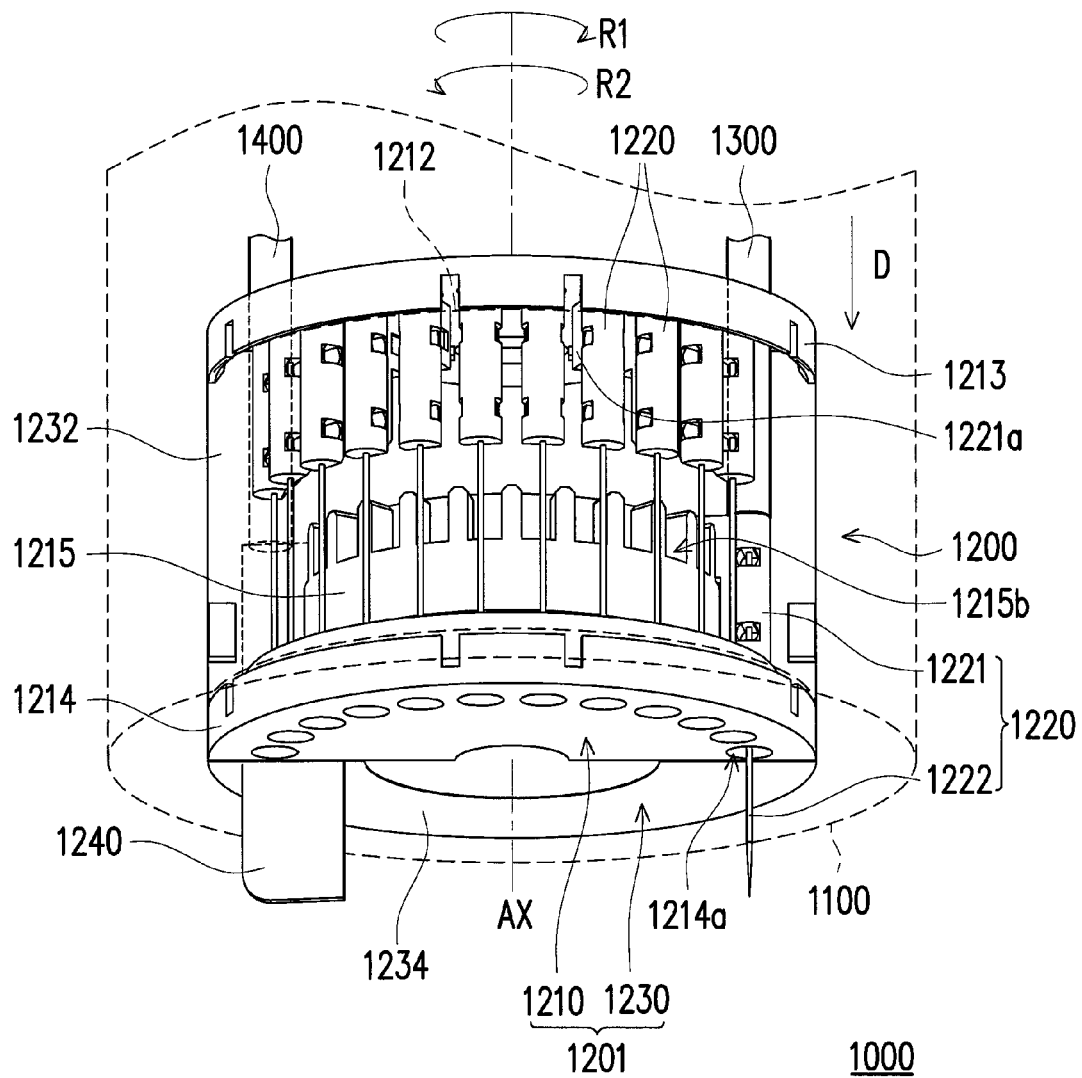


FIG. 3

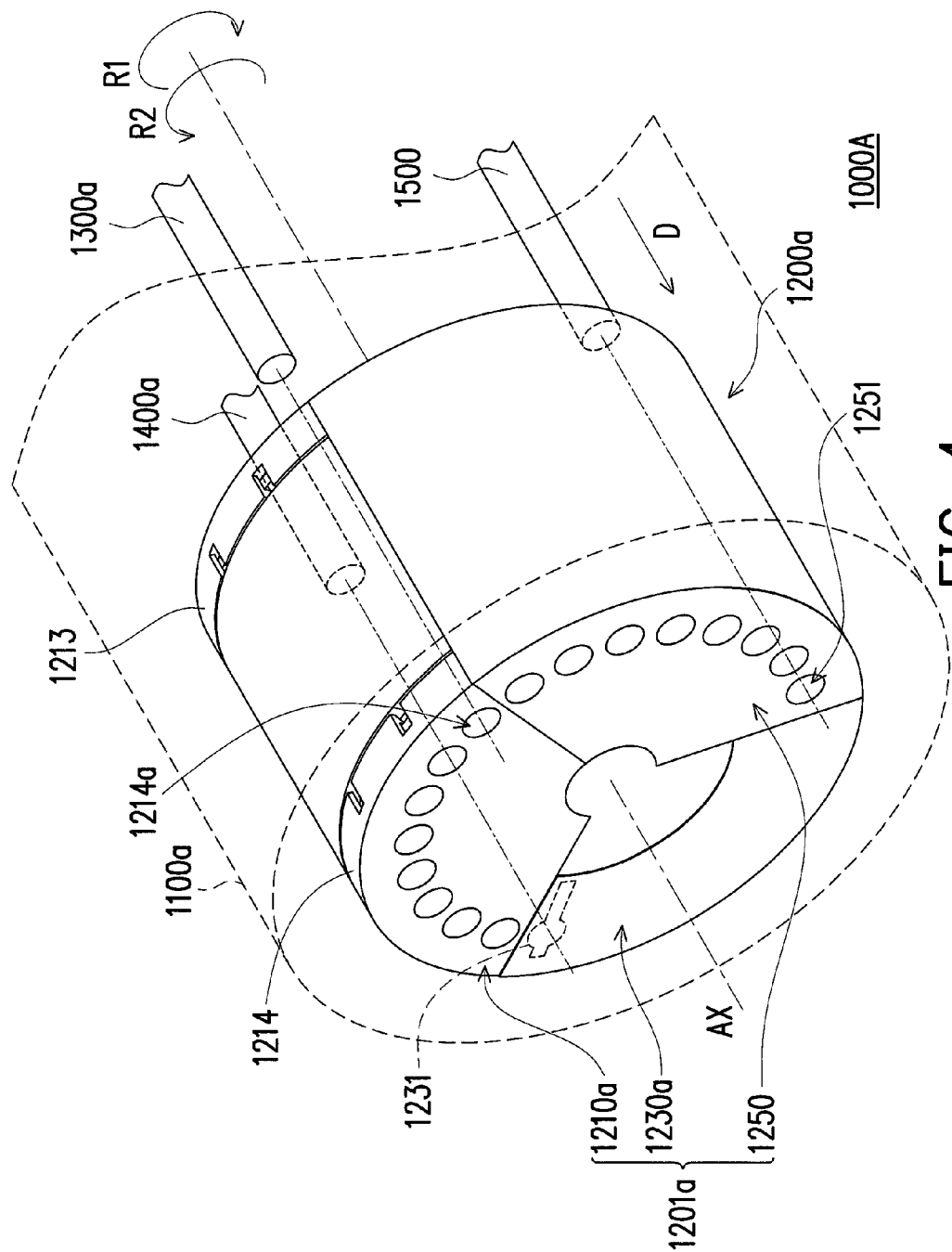
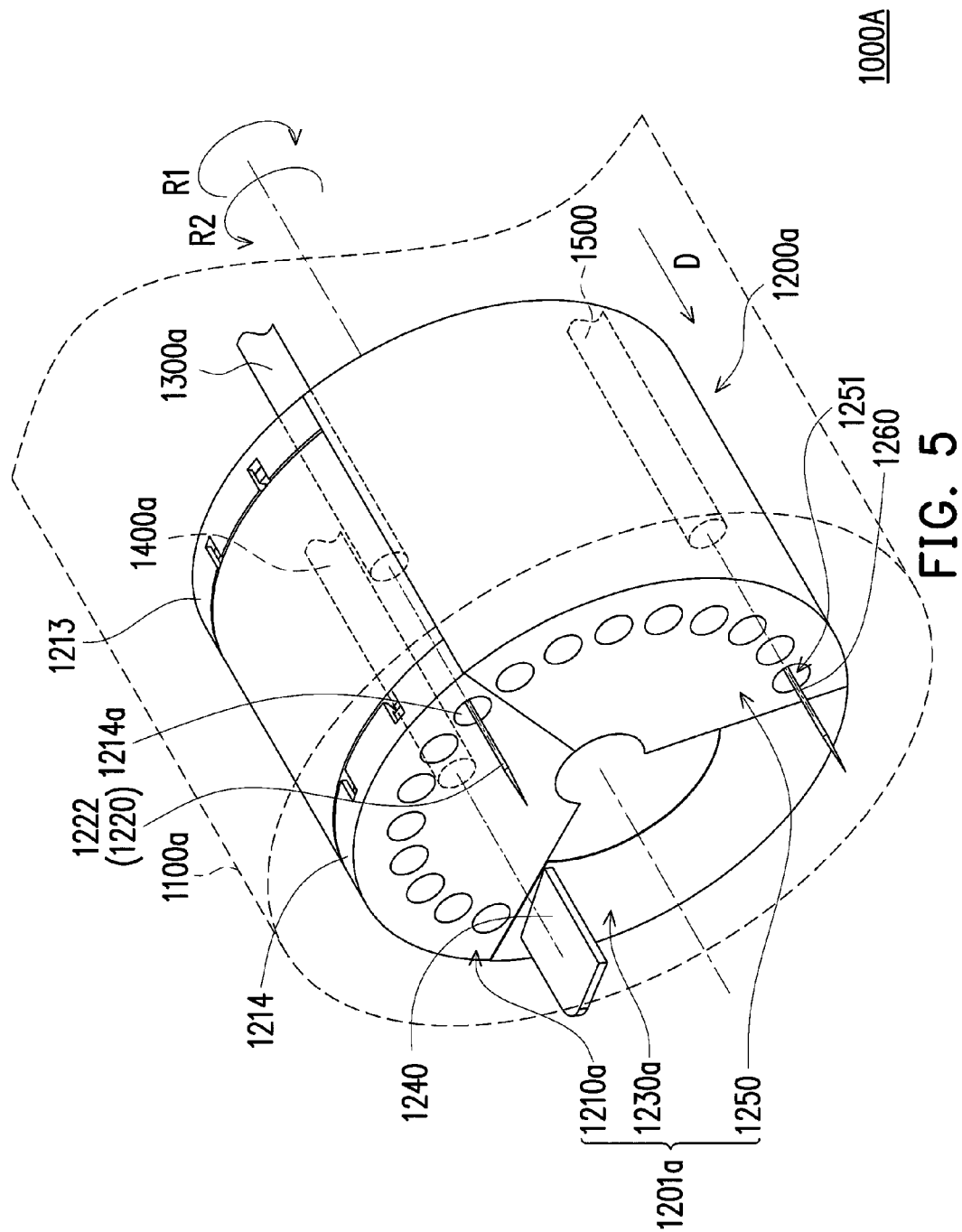


FIG. 4



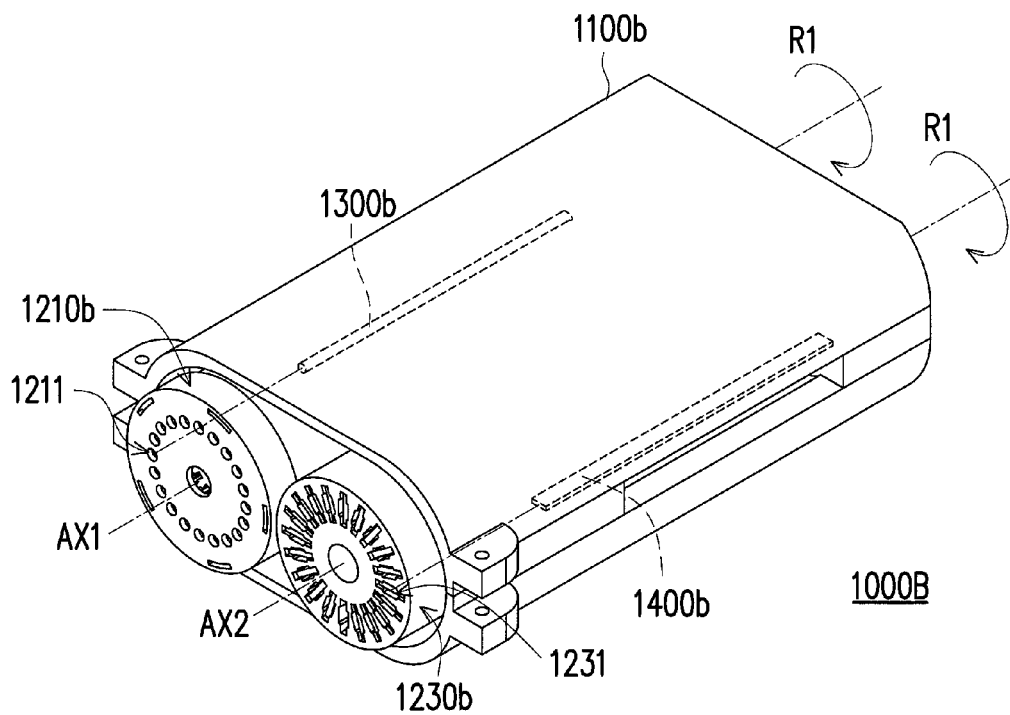


FIG. 6

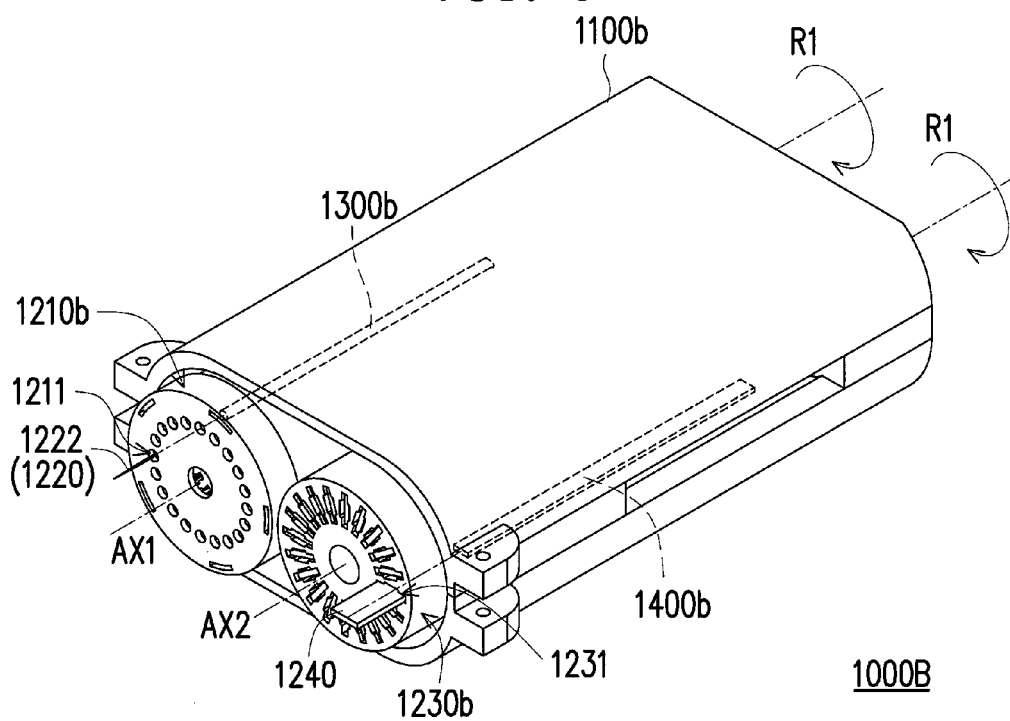


FIG. 7

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GLUCOSE TEST DEVICE**CROSS-REFERENCE TO RELATED APPLICATION**

This application claims the priority benefit of Taiwan application serial no. 103113890, filed on Apr. 16, 2014. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The invention generally relates to a test device, and more particularly, to a glucose test device with a carrying unit.

2. Description of Related Art

Following the development of technology and the increased health awareness, the general public has increasingly focused on health care related issues, and thus medical equipments have continued to evolve and be upgraded to comply with manufacturing specifications of the medical equipments and to meet the needs of the general public.

Taking a glucose test for an example, a variety of different types of lancing devices is derived from it, such as lancing pens, lancets or lancing burettes. The lancing device currently on the market are mostly consisted of a blood glucose meter in combination with a lancet and a strip; and therefore, during a process of using, a user must manually install the lancet and the strip, and after a blood sample and a test result are obtained, the user has to manually remove the used lancet and the used strip and reinstall a whole new lancet and a whole new strip before the next use. This way, even though the user may be prevented from health and testing concerns, such as bacterial infections or blood-borne infections, due to a repeat use of the lancet and the strip, but the installation steps of the lancet and the strip are complicated, and thereby is very inconvenient for the user to operate.

SUMMARY OF THE INVENTION

Accordingly, the invention is directed to a glucose test device and its carrying unit, which can avoid a process of repeatedly detaching lancets and strips, thereby improving a convenience of usage.

The glucose test device of the invention includes a housing, a carrying unit, a first push rod, and a second push rod. The carrying unit is detachably assembled in the housing. The carrying unit includes a first cartridge, a plurality of lancets, a second cartridge and a plurality of strips. The first cartridge has a plurality of first perforated grooves, and the lancets are slidably disposed in the first perforated grooves respectively. The second cartridge is adjacent to the first cartridge, and the second cartridge has a plurality of second perforated grooves. The strips are slidably disposed in the second perforated grooves respectively. The first push rod as corresponding to the first cartridge is movably disposed in housing. The second push rod as corresponding to the second cartridge is movably disposed in housing, wherein the first push rod is parallel to the second push rod.

The carrying unit of the invention is detachably disposed in a housing of a glucose test device. The carrying unit includes a first cartridge, a second cartridge, a plurality of strips, and a plurality of lancets. The first cartridge includes a first body, a carrier, and an elastic element. The first body has a plurality of first perforated grooves. The carrier is movably disposed in the first body. The elastic element is

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sleeved on a pillar portion of the carrier and abuts between the carrier and the first body. The second cartridge is assembled with the first cartridge to constitute a main cartridge body, wherein the second cartridge has a plurality of second perforated grooves. The strips are slidably disposed in the second perforated grooves respectively. The lancets are slidably disposed in the first perforated grooves respectively, and a holding portion of each of the lancets respectively leans against the carrier. When a needle portion of any one of the lancets moves out of the first body toward a firing direction, the carrier pushed by the said lancet moves toward a firing direction and compresses the elastic element, wherein an elastic restoring force of the elastic element is adapted to drive the carrier to move towards a direction opposite to the firing direction so as to recover the said lancet back into the first body.

In an embodiment of the invention, the first cartridge is pivoted in the housing along a first axis, and the second cartridge is pivoted in the housing along a second axis parallel to the first axis.

In an embodiment of the invention, the first perforated grooves surround the first axis and are equidistantly arranged on the first cartridge, and the second perforated grooves surround the second axis and are equidistantly arranged on the second cartridge. An amount of the first perforated grooves and an amount of the second perforated grooves are equal.

In an embodiment of the invention, when the first cartridge rotates in relative to the housing along the first axis to align one of the first perforated grooves with the first push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the first axis, and a needle portion of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod.

In an embodiment of the invention, when the second cartridge rotates in relative to the housing along the second axis to align one of the second perforated grooves with the second push rod, the second push rod moves into the said second perforated groove towards the firing direction, and the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod.

In an embodiment of the invention, the first cartridge is assembled with the second cartridge to constitute a main cartridge body, and the main cartridge body is pivoted in the housing along a main axis.

In an embodiment of the invention, the first cartridge has a plurality of slots, the second cartridge has a plurality of hooks disposed corresponding to the slots, and the hooks are respectively engaged in the slots so as to fix the first cartridge and the second cartridge.

In an embodiment of the invention, the first push rod and the second push rod are respectively located at opposite corners of the main cartridge body.

In an embodiment of the invention, when the main cartridge body rotates in relative to the housing along the main axis to align one of the first perforated grooves with the first push rod and one of the second perforated grooves with the second push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the main axis, and a needle portion of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod. In addition, the second push rod moves into the said second perforated groove towards the firing direction, and the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod, wherein a line-up order of the said first perforated groove on

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the first cartridge matches a line-up order of the said second perforated groove on the second cartridge.

In an embodiment of the invention, the first cartridge includes a first body, a first cover, a second cover, a carrier and an elastic element. The first perforated grooves are disposed at the first body. The first cover and the second cover are respectively disposed in two opposite sides of the first body, and the first cover and the second cover respectively have a plurality of through holes corresponding to the first perforated grooves. The carrier is movably disposed in the first body, and a holder portion of each of the lancets leans against the carrier. The elastic element is sleeved on a pillar portion of the carrier and abuts between the carrier and the first body.

In an embodiment of the invention, the first cartridge further includes a buffer layer. The buffer layer is disposed between the second cover and the first body for separating the through holes on the second cover from the first perforated grooves.

In an embodiment of the invention, the second cartridge includes a second body and two film layers. The second perforated grooves are disposed at the second body. The two film layers are respectively disposed at two opposite sides of the second body for covering the second perforated grooves.

In an embodiment of the invention, the carrying unit further includes a third cartridge and a plurality of supplementary elements. The third cartridge has a plurality of third perforated grooves. The glucose test device further includes a third push rod parallel to the first push rod, wherein the third push rod as corresponding to the third cartridge is movably disposed in the housing. The first cartridge, the second cartridge and the third cartridge are assembled with each other to constitute a main cartridge body, and the main cartridge body is pivoted in the housing along a main axis. The supplementary elements are slidably disposed in the third perforated grooves respectively.

In an embodiment of the invention, the first perforated grooves surround the main axis and are equidistantly arranged on the first cartridge, the second perforated grooves surround the main axis and are equidistantly arranged on the second cartridge, and the third perforated grooves surround the main axis and are equidistantly arranged on the third cartridge. An amount of the first perforated grooves, an amount of the second perforated grooves and an amount of the third perforated grooves are equal.

In an embodiment of the invention, a distance between the first push rod and the second push rod, a distance between the second push rod and the third push rod and a distance between the third push rod and the first push rod are equal to each other.

In an embodiment of the invention, when the main cartridge body rotates in relative to the housing along the main axis to align one of the first perforated grooves with first push rod, one of the second perforated grooves with the second push rod, and one of the third perforated grooves with the third push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the main axis, a needle portion of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod, the second push rod moves into the said second perforated groove towards the firing direction, the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod, the third push rod moves into the said third perforated groove towards the firing direction, and the supplementary element in the said third perforated groove is pushed out of the third cartridge by the third push rod, wherein a line-up order of the said first

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perforated groove on the first cartridge, a line-up order of the said second perforated groove on the second cartridge and a line-up order of the said third perforated groove on the third cartridge are matched with each other.

In an embodiment of the invention, the holder portion has a protruding portion, and the protruding portion is positioned in a notch of the carrier, so that each of the lancets abuts against the carrier respectively.

In view of above, the carrying unit of the invention at least includes the first cartridge and the second cartridge, wherein the first cartridge is configured with a plurality of lancets therein, and the second cartridge is configured with a plurality of strips corresponding to the amount of the lancets. Therefore, each time when performing a glucose test, the glucose test device may automatically be replaced with un-used lancet and strip to perform sampling and testing of blood through using the carrying unit, and thus can avoid a process of repeatedly detaching the lancets and the strips, thereby improving a convenience of usage.

To make the aforementioned and other features and advantages of the invention more comprehensible, several embodiments accompanied with drawings are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

FIG. 1 is a partial schematic view illustrating a glucose test device according to an embodiment of the invention.

FIG. 2 is an exploded schematic view illustrating a carrying unit of FIG. 1.

FIG. 3 is a schematic view illustrating the glucose test device of FIG. 1 pushing a lancet and a strip out of the carrying unit.

FIG. 4 is a partial schematic view illustrating a glucose test device according to another embodiment of the invention.

FIG. 5 is a schematic view illustrating the glucose test device of FIG. 4 pushing a lancet and a strip out of a carrying unit.

FIG. 6 is a partial schematic view illustrating a glucose test device according to yet another embodiment of the invention.

FIG. 7 is a schematic view illustrating the glucose test device of FIG. 6 pushing a lancet and a strip out of a carrying unit.

DESCRIPTION OF THE EMBODIMENTS

FIG. 1 is a partial schematic view illustrating a glucose test device according to an embodiment of the invention. FIG. 2 is an exploded schematic view illustrating a carrying unit of FIG. 1. FIG. 3 is a schematic view illustrating the glucose test device of FIG. 1 pushing a lancet and a strip out of the carrying unit, wherein for the description clarity, housing 1100 and first body 1212 are illustrated with dashed lines. Referring to FIG. 1 and FIG. 2, in the present embodiment, a glucose test device 1000 includes a housing 1100, a carrying unit 1200, a first push rod 1300, and a second push rod 1400, wherein the housing 1100 may be fabricated with plastic, acrylic, metal, carbon fiber, composite material or other suitable material.

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The carrying unit 1200 is detachably assembled in the housing 1100 and includes a first cartridge 1210, a plurality of lancets 1220, a second cartridge 1230 and a plurality of strips 1240. The first cartridge 1210 has a plurality of first perforated grooves 1211, and the lancets 1220 are slidably disposed in the first perforated grooves 1211 respectively. The second cartridge 1230 is adjacent to the first cartridge 1210, wherein the second cartridge 1230 has a plurality of second perforated grooves 1231, and the strips 1240 are slidably disposed in the second perforated grooves 1231 respectively. Herein, the first cartridge 1210 and the second cartridge 1230 are substantially appeared to be semicylindrical in shapes and are adapted to assemble with each other to constitute a main cartridge body 1201. The main cartridge body 1201 constituted by assembling the first cartridge 1210 and the second cartridge 1230 is substantially appeared to be cylindrical in shape and is pivoted in the housing 1100 along a main axis AX.

On the other hand, an amount of the second perforated grooves 1231 and an amount of the first perforated grooves 1211 are equal, wherein the first perforated grooves 1211 surround the main axis AX and are equidistantly arranged on the first cartridge 1210, and the second perforated grooves 1231 surround the main axis AX and are equidistantly arranged on the second cartridge 1230. In the present embodiment, the first perforated grooves 1211, for example, are radially arranged on the main cartridge body 1201 along a counter-clockwise direction R2, and the second perforated grooves 1231, for example, are lined-up after the first perforated groove 1211 with a line-up order being the last, and are radially arranged on the main cartridge body 1201 along the counter-clockwise direction R2 until the second perforated groove 1231 with a line-up order being the last is adjacent to the first perforated groove 1211 with a line-up order being the first. In view of the above design principles, in an embodiment (not shown), the first perforated grooves 1211 and the second perforated grooves 1231 may also be radially arranged on the main cartridge body 1201 along a clockwise direction R1, and the invention is not limited thereto.

In the present embodiment, the first push rod 1300 as corresponding to the first cartridge 1210 is movably disposed in the housing 1100, and second push rod 1400 as corresponding to the second cartridge 1230 is movably disposed in the housing 1100, wherein the first push rod 1300 and the second push rod 1400 are parallel to each other and respectively located at opposite corners of the main cartridge body 1201. Specifically, a cross-sectional profile of the first push rod 1300 is identical to a cross-sectional profile of each of the first perforated grooves 1211, and a cross-sectional profile of the second push rod 1400 is identical to a portion of the cross-sectional profile of each of the second perforated grooves 1231. Therefore, in a subsequent process where the first push rod 1300 pushes any one of the lancets 1220 from its corresponding first perforated groove 1211 to the outside of the first cartridge 1210, the first push rod 1300 may smoothly move into the said first perforated groove 1211 to push out the said lancet 1220. And, in a subsequent process where the second push rod 1400 pushes any one of the strips 1240 from its corresponding second perforated groove 1231 to the outside of the second cartridge 1230, second push rod 1400 may smoothly move into the said second perforated groove 1231 to push out the said strip 1240.

On the other hand, the first cartridge 1210 may include a first body 1212, a first cover 1213, a second cover 1214, a carrier 1215, and an elastic element 1216. The second

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cartridge 1230 includes a second body 1232 and two film layers 1233 and 1234. The first body 1212 has a plurality of slots 1212a, and the second body 1232 has a plurality of hooks 1232a disposed corresponding to the slots 1212a. Therefore, in a processing of assembling the first cartridge 1210 with the second cartridge 1230, the first body 1212 may be fixed to the second body 1232 by engaging the hooks 1232a into the slots 1212a.

Specifically, the first perforated grooves 1211 are disposed at the first body 1212, and the second perforated grooves 1231 are disposed at the second body 1232. The first cover 1213 and the second cover 1214 are respectively disposed at two opposite sides of the first body 1212, and the first cover 1213 and the second cover 1214 respectively have a plurality of through holes 1213a and 1214a disposed corresponding to the first perforated grooves 1211. The film layers 1233 and 1234 are respectively disposed at two opposite sides of the second body 1232 and cover the second perforated grooves 1231, wherein the film layers 1233 and 1234 are fabricated with aluminum foil, copper foil or other suitable material, and are configured to prevent the strips 1240 from easily falling out of the second cartridge 1230 from the second perforated grooves 1231. In addition, the carrier 1215 is movably disposed in the first body 1212, wherein the elastic element 1216, for example, is sleeved on a pillar portion 1215a of the carrier 1215 and abuts between the carrier 1215 and the first body 1212. Besides, a holder portion 1221 of each of the lancets 1220 leans against the carrier 1215, and a needle portion 1222 connected to the holder portion 1221 is located in the corresponding first perforated groove 1211. More specifically, the holder portion 1221 of each of the lancets 1220 has a protruding portion 1221a, and each protruding portion 1221a may respectively be positioned in a plurality of notches 1215b of the carrier 1215, so that each of the lancets 1220 may respectively be abutting against the carrier 1215.

Referring to FIGS. 1 through 3, in the present embodiment, when the main cartridge body 1201 rotates in relative to the housing 1100 along the main axis AX (e.g., rotates along the clockwise direction R1) to align any one of the first perforated grooves 1211 with the first push rod 1300 and any one of the second perforated grooves 1231 with the second push rod 1400, the first push rod 1300 may move into the said first perforated groove 1211 towards a firing direction D parallel to the main axis AX, and the holder portion 1221 of the lancet 1220 in the said first perforated groove 1211 is pushed by the first push rod 1300, thereby causing the needle portion 1222 of the lancet 1220 to move out of the first cartridge 1210. Since the holder portion 1221 of each of the lancets 1220 is leaned against the carrier 1215, in the above mentioned process where the first push rod 1300 pushes the needle portion 1222 of the said lancet 1220 out of the first cartridge 1210, the holder portion 1221 of the said lancet 1220 may push the carrier 1215 to move towards the firing direction D by using structural interferences with the carrier 1215, so that the elastic element 1216 is compressed. Now, the holder portions 1221 of the rest of the lancets 1220 not being pushed by the first push rod 1300 are separated from the carrier 1215 and are maintained at their original positions in the first body 1212.

The first push rod 1300, before moving into one of the first perforated grooves 1211 towards the firing direction D, must firstly pass through a through hole 1213a corresponded to the said first perforated groove 1211, wherein the first push rod 1300 matches an opening profile of the through holes 1213a, so that the first push rod 1300 may smoothly pass through the through hole 1213a and move into the said first

perforated groove **1211**, and thereby pushes the lancet **1220** in the said first perforated groove **1211**, so that the needle portion **1222** of the lancet **1220** passes through the corresponding through hole **1214a** and moves out of the first cartridge **1210**. Specifically, the first cartridge **1210** further includes a buffer layer **1217**, wherein the buffer layer **1217** is disposed between the second cover **1214** and the first body **1212** for separating the through holes **1214a** on the second cover **1214** from the first perforated grooves **1211**. Therefore, when the lancet **1220** is pushed by the first push rod **1300** to move towards the firing direction D, the needle portion **1222** of the lancet **1220** may firstly pass through the buffer layer **1217** and then pass through the corresponding through hole **1214a** so as to sample a user's blood.

In general, a blood sample is usually obtained by using the needle portion **1222** to puncture finger pulp of the user. Under the condition that the holder portions **1221** of other lancets **1220** are separated from the carrier **1215**, the needle portions **1222** of the other lancets **1220** may be blocked by the buffer layer **1217**, and thereby would not easily move out of the first cartridge **1210** from each of the corresponding through holes **1214a**. For example, the buffer layer **1217** may be a sponge containing alcohol or other disinfection substances, and thus a purpose of sterilizing the needle portion **1222** of the lancet **1220** may be achieved while the needle portion **1222** passes through the buffer layer **1217**, thereby lowering the chances of having bacterial infection when the user uses the needle portion **1222** to sample the blood.

On the other hand, the second push rod **1400** may move into one of the second perforated grooves **1231** towards the firing direction D, and the strip **1240** in the said second perforated groove **1231** is pushed out of the second cartridge **1230** by the second push rod **1400**. Specifically, the second push rod **1400** must firstly pass through the film layer **1233** before move into the said second perforated groove **1231**, so as to push the strip **1240** in the said second perforated groove **1231** towards the firing direction D. The strip **1240** as being pushed by the second push rod **1400** perforates the film layer **1234** in order to move out of the second cartridge **1230**. Now, the blood sample obtained through using the lancet **1220** may drop on the strip **1240**, and the strip **1240** containing the user's blood may further be tested for the user's glucose level through using a test element (not shown) in the glucose test device **1000**, so as to achieve the purpose of timely monitoring the glucose level. In the above descriptions, the line-up order of the said first perforated groove **1211** on the first cartridge **1210** matches the line-up order of the said second perforated groove **1231** on the second cartridge **1230**; and for the purpose of description herein, the line-up orders are, for example, the first of the first perforated grooves **1211** and the first of the second perforated grooves **1231**, respectively.

After sampling of the blood, an elastic restoring force of the elastic element **1216** may drive the carrier **1215** to move towards a direction opposite to the firing direction D so as to return back to an initial position as shown in FIG. 1. At the same time, by using structure interferences between the carrier **1215** and the holder portion **1221** of the lancet **1220**, when the carrier **1215** is driven by the elastic restoring force of the elastic element **1216** to move towards the direction opposite to the firing direction D, the lancet **1220** may be recover back into the first cartridge **1210**, thereby preventing the used lancet **1220** from random disposal and causing environmental health distress. Now, the carrier **1215** as being returned back to the initial position may abut against the holder portion **1221** of each of the lancets **1220** so as to

facilitate the subsequent use. On the other hand, the strip **1240** that containing the user's blood may be pulled back into the second cartridge **1230** by the second push rod **1400**, or be recovered to a recovery tank (not shown) in the housing **1100**, so as to prevent the used strip **1240** from random disposal and causing environmental health distress.

Since the carrying unit **1200** merely uses a single elastic element **1216** to recover the lancets **1220**, which are being pushed out at different locations, back into the first body **1212**, such that several lancets **1220** are sharing the same elastic element **1216**, it does not require to individually install each of the lancets **1220** with an elastic element for recovering the lancet **1220** back into the first body **1212**, thereby providing better competitiveness in the overall structure design and the cost consideration.

In view of the above, when the user is to perform the glucose level test again, the user may enable the main cartridge body **1201** to rotate in relative to the housing **1100** along the main axis AX (i.e., rotate towards the clockwise direction R1) to align the first push rod **1300** with the next first perforated groove **1211** in line and align the second push rod **1400** with the next second perforated grooves **1231** in line; namely, the first perforated groove **1211** with a line-up order being the second, and the second perforated groove **1231** with a line-up order being the second. The first push rod **1300** may move into the first perforated groove **1211** with a line-up order being the second towards the firing direction D so as to push the needle portion **1222** of the lancet **1220** out of the first cartridge **1210**, and the second push rod **1400** may move into the second perforated groove **1231** with a line-up order being the second towards the firing direction D to push the strip **1240** out of the second cartridge **1230**, so as to perform the blood sampling action, wherein the specific operational means of each components may be referred back to the descriptions provided in the above, and will not be repeated herein.

In the aforementioned embodiment, since the first perforated grooves **1211** and the second perforated grooves **1231** are, for example, radially arranged on the main cartridge body **1201** along the counter-clockwise direction R2, the main cartridge body **1201** has to rotate in relative to the housing **1100** along the clockwise direction R1 so as to achieve the purpose of automatically replacing the lancets **1220** and the strips **1240**. In an embodiment (not shown), when the first perforated grooves **1211** and the second perforated grooves **1231** are, for example, radially arranged on the main cartridge body **1201** along the clockwise direction R1, the main cartridge body **1201** thus has to rotate in relative to the housing **1100** along the counter-clockwise direction R2 so as to achieve the purpose of replacing the lancets **1220** and the strips **1240**.

In addition, since the carrying unit **1200** is detachably disposed in the housing **1100** of the glucose test device **1000**, when the lancets **1220** in the first cartridge **1210** and the strips **1240** in the second cartridge **1230** are all being used, the user may detach the old carrying unit **1200** and replace a whole new carrying unit **1200** into the housing **1100** of the glucose test device **1000** for continue usage.

FIG. 4 is a partial schematic view illustrating a glucose test device according to another embodiment of the invention. FIG. 5 is a schematic view illustrating the glucose test device of FIG. 4 pushing a lancet and a strip out of a carrying unit. Referring to FIG. 4 and FIG. 5, different from the glucose test device **1000** of the previous embodiment, in a glucose test device **1000A** of the present embodiment, a carrying unit **1200A** further includes at least one third cartridge **1250** (illustrated as one in FIG. 4) and a plurality

of supplementary elements **1260**. The third cartridge **1250** has a plurality of third perforated grooves **1251**, and the supplementary elements **1260** (e.g., insulin injection needles) are slidably disposed in the third perforated grooves **1251** respectively, wherein a first cartridge **1210a**, a second cartridge **1230a** and a third cartridge **1250** are assembled with each other to constitute a main cartridge body **1201a**, and the main cartridge body **1201a** is pivoted in the housing **1100a** along the main axis AX. Component compositions in the first cartridge **1210a** and the second cartridge **1230a** are the same as in the first cartridge **1210** and the second cartridge **1230**, and will not be repeated herein.

On the other hand, the glucose test device **1000A** further includes at least one third push rod **1500** (illustrated as one in FIG. 4) parallel to the first push rod **1300a**, wherein the third push rod **1500** as corresponding to the third cartridge **1250** is movably disposed in the housing **1100a**. Specifically, a distance between the first push rod **1300a** and the second push rod **1400a**, a distance between the second push rod **1400a** and the third push rod **1500** and a distance between the third push rod **1500** and the first push rod **1300a** are equal to each other.

The third perforated grooves **1251** surround the main axis AX and are equidistantly arranged on the third cartridge **1250**, and an amount of the first perforated grooves **1211** (not shown) in the first cartridge **1210a**, an amount of the second perforated grooves **1231** (not shown) in the second cartridge **1230a** and an amount of the third perforated grooves **1251** are equal. In the present embodiment, the third perforated grooves **1251**, for example, are lined-up after the second perforated groove **1231** with a line-up order being the last, and are radially arranged on the main cartridge body **1201a** along the counter-clockwise direction R2 until the third perforated groove **1251** with a line-up order being the last is adjacent to the first perforated groove **1211** with a line-up order being the first. Namely, the third cartridge **1250**, for example, is connected between the first cartridge **1210a** and the second cartridge **1230a**. In view of the above design principles, in an embodiment (not shown), the first perforated grooves **1211**, the second perforated grooves **1231** and the third perforated grooves **1251** may also be radially arranged on the main cartridge body **1201a** along a clockwise direction R1, and the invention is not limited thereto.

On the other hand, a cross-sectional profile of the third push rod **1500** is identical to a cross-sectional profile of each of the third perforated grooves **1251**, and thus in a subsequent process where the third push rod **1500** pushes any one of the supplementary elements **1260** from its corresponding third perforated groove **1251** to the outside of the third cartridge **1250**, the third push rod **1500** may smoothly move into the said third perforated groove **1251** to push out the said supplementary element **1260**.

When the main cartridge body **1201a** rotates in relative to the housing **1100a** along the main axis AX (e.g., rotates along the clockwise direction R1) to align any one of the first perforated grooves **1211** with the first push rod **1300a**, any one of the second perforated grooves **1231** with the second push rod **1400a** and any one of the third perforated grooves **1251** with the third push rod **1500**, the third push rod **1500** may also move into the third perforated grooves **1251** towards the firing direction D, and the supplementary element **1260** in the said third perforated groove **1251** is pushed out of the third cartridge **1250** by the third push rod **1500**, wherein a line-up order of said first perforated groove **1211** on the first cartridge **1210**, and a line-up order of the said second perforated groove **1231** on the second cartridge **1230**

and a line-up order of the said third perforated groove **1251** on the third cartridge **1250** are matched with each other. For the purpose of description herein, the line-up orders are, for example, the first of the first perforated grooves **1211**, the first of the second perforated grooves **1231** and the first of the third perforated grooves **1251**. Wherein, specific operational means between the first push rod **1300a** and the lancets **1220** and between the second push rod **1400a** and the strips **1240** may be referred back to the above descriptions, and will not be repeated herein.

In view of the above design principles, in an embodiment (not shown), the first perforated grooves **1211**, the second perforated grooves **1231** and the third perforated grooves **1251** may also be radially arranged on the main cartridge body **1201a** along the clockwise direction R1, and the invention is not limited thereto. Then, the main cartridge body **1201a** has to rotate in relative to the housing **1100a** along the counter-clockwise direction R2 so as to achieve the purpose of replacing the lancets **1220**, the strips **1240** and the supplementary elements **1260**.

In other words, the glucose test device **1000A** not only can achieve the purpose of automatically replacing the lancets **1220** and the strips **1240** by using the carrying unit **1200a**, but also can push the supplementary elements **1260** out of the third cartridge **1250** by using the third push rod **1500**, so as to inject insulin to lower the user's glucose level when the user's glucose level being too high. On the other hand, in an embodiment (not shown), depending on the actual needs, the glucose test device **1000A** may be configured with more than two third cartridges **1250**, and other needles, strips or medicines in need may also be installed in the corresponding third perforated grooves **1251** so as to fulfil the user's choices, and thereby enhances a flexibility of application.

FIG. 6 is a partial schematic view illustrating a glucose test device according to yet another embodiment of the invention. FIG. 7 is a schematic view illustrating the glucose test device of FIG. 6 pushing a lancet and a strip out of a carrying unit. Referring to FIG. 6 and FIG. 7, different from the glucose test device **1000** of the previous embodiment, in a glucose test device **1000B** of the present embodiment, a carrying unit **1200b** includes a first cartridge **1210b** and a second cartridge **1230b** disposed parallel to each other, wherein the first cartridge **1210b** is pivoted in the housing **1100b** along a first axis AX1, and the second cartridge **1230b** is pivoted in the housing **1100b** along a second axis AX2 parallel to the first axis AX1.

On the other hand, the first perforated grooves **1211** surround the first axis AX1 and are equidistantly arranged on the first cartridge **1210b**, the second perforated grooves **1231** surround the second axis AX2 and are equidistantly arranged on the second cartridge **1230b**, and an amount of the first perforated grooves **1211** and an amount of the second perforated grooves **1231** are equal. The first push rod **1300b** and the second push rod **1400b**, for example, are respectively located at two opposite sides of the carrying unit **1200b**. When the first cartridge **1210b** rotates in relative to the housing **1100b** along the first axis AX1 to align any one of the first perforated grooves **1211** with the first push rod **1300b**, the first push rod **1300b** moves into the said first perforated groove **1211** towards a firing direction D1 parallel to the first axis AX1, and the needle portion **1222** of the lancet **1220** in the said first perforated groove **1211** is pushed out of the first cartridge **1210b** by the first push rod **1300b**, so as to sample the user's blood. Herein, for the purpose of description, the first cartridge **1210b** is, for example, illus-

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trated as rotating in relative to the housing **1100b** along the clockwise direction R1, but the invention is not limited thereto.

When the second cartridge **1230b** rotates in relative to the housing **1100b** along the second axis AX2 to align any one of the second perforated grooves **1231** with the second push rod **1400b**, the second push rod **1400b** moves into the said second perforated groove **1231** towards the firing direction D1, and the strip **1240** in the said second perforated groove **1231** is pushed out of the second cartridge **1230b** by the second push rod **1400b**. Then, the blood sample obtained through the lancet **1220** may drop on the strip **1240** for the subsequent testing of the user's glucose level. Herein, for the purpose of description, the second cartridge **1230b** is, for example, illustrated as rotating in relative to the housing **1100b** along the clockwise direction R1, but the invention is not limited thereto.

In summary, the carrying unit of the invention at least include the first cartridge and the second cartridge, wherein the first cartridge is configured with a plurality of lancets therein, and the second cartridge is configured with a plurality of strips corresponding to the amount of the lancets. In addition, the first cartridge and the second cartridge may be parallelly disposed in the housing, or may be disposed in the housing after assembled with each other to constitute the main cartridge body. Therefore, each time when performing the glucose test, the user may use the carrying unit to automatically replace lancets and strips for performing the sampling and testing of blood, and thus avoids a process of repeatedly detaching the lancets and the strips, thereby improving a convenience of usage, and further preventing the lancets and the strips from being reused and causing bacterial infection or blood-borne infection.

On the other hand, since the carrying unit is detachably disposed in the housing of the glucose test device, when the lancets in the first cartridge and the strips in the second cartridge are all being used, the user may detach the old carrying unit and replace a whole new carrying unit into the housing of the glucose test device for subsequent use. Moreover, depending on the actual needs, the glucose test device may be configured with more than two third cartridges, and other needles, strips or medicines in need may also be installed in the corresponding third perforated grooves in the third cartridge so as to fulfil the user's choices, and thereby enhances the flexibility of application.

It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A glucose test device, comprising:

a housing;

a carrying unit detachably assembled in the housing, the carrying unit comprising:

a first cartridge, comprising:

a first body, having a plurality of first perforated grooves;

a carrier movably disposed in the first body; and
an elastic element sleeved on a pillar portion of the carrier and abutted between the carrier and the first body;

a plurality of lancets slidably disposed in the first perforated grooves respectively, and each of the lancets leaned against the carrier respectively;

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a second cartridge adjacent to the first cartridge, and the second cartridge having a plurality of second perforated grooves; and

a plurality of strips slidably disposed in the second perforated grooves respectively;

a first push rod as corresponding to the first cartridge being movably disposed in the housing; and

a second push rod as corresponding to the second cartridge being movably disposed in the housing, wherein the first push rod is parallel to the second push rod.

2. The glucose test device as recited in claim 1, wherein the first cartridge is pivoted in the housing along a first axis, and the second cartridge is pivoted in the housing along a second axis parallel to the first axis, the first perforated grooves surround the first axis and are equidistantly arranged on the first cartridge, the second perforated grooves surround the second axis and are equidistantly arranged on the second cartridge, and an amount of the first perforated grooves and an amount of the second perforated grooves are equal, wherein when the first cartridge rotates in relative to the housing along the first axis to align one of the first perforated grooves with the first push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the first axis, and a needle portion of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod, wherein when the second cartridge rotates in relative to the housing along the second axis to align one of the second perforated grooves with the second push rod, the second push rod moves into the said second perforated groove towards a firing direction, and the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod,

and wherein a line-up order of the said first perforated groove on the first cartridge matches a line-up order of the said second perforated groove on the second cartridge.

3. The glucose test device as recited in claim 1, wherein the first cartridge is assembled with the second cartridge to constitute a main cartridge body, the main cartridge body is pivoted in the housing along a main axis, the first perforated grooves and the second perforated grooves are concentrically arranged on the main cartridge body, the first perforated grooves are located on a half of the main cartridge body, and the second perforated grooves are located on another half of the main cartridge body.

4. The glucose test device as recited in claim 3, wherein the first cartridge has a plurality of slots, the second cartridge has a plurality of hooks disposed corresponding to the slots, and the hooks are respectively engaged in the slots so as to fix the first cartridge and the second cartridge.

5. The glucose test device as recited in claim 3, wherein the first perforated grooves surround the main axis and are equidistantly arranged on the first cartridge, the second perforated grooves surround the main axis and are equidistantly arranged on the second cartridge, and an amount of the first perforated grooves and an amount of the second perforated grooves are equal.

6. The glucose test device as recited in claim 5, wherein the first push rod and the second push rod are respectively located at opposite corners of the main cartridge body.

7. The glucose test device as recited in claim 6, wherein the main cartridge body is configured to rotate in relative to the housing along the main axis to align one of the first perforated grooves with the first push rod and one of the second perforated grooves with the second push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the main axis, a needle portion

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of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod, the second push rod moves into the said second perforated groove towards the firing direction, and the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod, wherein a line-up order of the said first perforated groove on the first cartridge matches a line-up order of the said second perforated groove on the second cartridge,

wherein the first perforated grooves and the second perforated grooves are radially arranged on the main cartridge body along the counter-clockwise direction, and the main cartridge body rotates in relative to the housing along the clockwise direction, or wherein the first perforated grooves and the second perforated grooves are radially arranged on the main cartridge body along the clockwise direction, and the main cartridge body rotates in relative to the housing along the counter-clockwise direction.

8. The glucose test device as recited in claim 1, wherein the first cartridge further comprises:

- a first cover and a second cover respectively disposed in two opposite sides of the first body, and the first cover and the second cover respectively having a plurality of through holes corresponding to the first perforated grooves; and
- a buffer layer disposed between the second cover and the first body for separating the through holes on the second cover from the first perforated grooves.

9. The glucose test device as recited in claim 1, wherein the second cartridge comprises:

- a second body, the second perforated grooves disposed at the second body; and
- two film layers respectively disposed at two opposite sides of the second body for covering the second perforated grooves.

10. The glucose test device as recited in claim 1, wherein the carrying unit further comprises:

- a third cartridge having a plurality of third perforated grooves, the glucose test device further comprising a third push rod parallel to the first push rod, wherein the third push rod as corresponding to the third cartridge is movably disposed in the housing, the first cartridge, the second cartridge and the third cartridge are assembled with each other to constitute a main cartridge body, and the main cartridge body is pivoted in the housing along a main axis; and
- a plurality of supplementary elements slidably disposed in the third perforated grooves respectively.

11. The glucose test device as recited in claim 10, wherein the first perforated grooves surround the main axis and are

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equidistantly arranged on the first cartridge, the second perforated grooves surround the main axis and are equidistantly arranged on the second cartridge, the third perforated grooves surround the main axis and are equidistantly arranged on the third cartridge, and an amount of the first perforated grooves, an amount of the second perforated grooves and an amount of the third perforated grooves are equal, wherein a distance between the first push rod and the second push rod, a distance between the second push rod and the third push rod and a distance between the third push rod and the first push rod are equal to each other, wherein when the main cartridge body rotates in relative to the housing along the main axis to align one of the first perforated grooves with first push rod, one of the second perforated grooves with the second push rod, and one of the third perforated grooves with the third push rod, the first push rod moves into the said first perforated groove towards a firing direction parallel to the main axis, a needle portion of the lancet in the said first perforated groove is pushed out of the first cartridge by the first push rod, the second push rod moves into the said second perforated groove towards the firing direction, the strip in the said second perforated groove is pushed out of the second cartridge by the second push rod, the third push rod moves into the said third perforated groove towards the firing direction, and the supplementary element in the said third perforated groove is pushed out of the third cartridge by the third push rod, wherein a line-up order of the said first perforated groove on the first cartridge, a line-up order of the said second perforated groove on the second cartridge and a line-up order of the said third perforated groove on the third cartridge are matched with each other.

12. The glucose test device as recited in claim 1, wherein a holder portion of each of the lancets leaned against the carrier respectively and when a needle portion of any one of the lancets moves out of the first body toward a firing direction, the carrier pushed by the said lancet moves towards the firing direction and compresses the elastic element, wherein an elastic restoring force of the elastic element is adapted to drive the carrier to move towards a direction opposite to the firing direction so as to recover the said lancet back into the first body.

13. The glucose test device as recited in claim 12, wherein the holder portion of each of the lancets has a protruding portion, and each of the protruding portions is respectively positioned in one of a plurality of notches of the carrier, so that each of the lancets abuts against the carrier respectively.

14. The glucose test device as recited in claim 3, wherein the first cartridge and the second cartridge are semicylindrical in shapes.

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